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(54) **REACTIVE ENERGY COMPENSATOR AND METHOD FOR REDUCING THE ASSOCIATED FLICKERING PHENOMENON**

(71) Applicant: **GE Energy Power Conversion Technology Ltd.**, Rugby, Warwickshire (GB)

(72) Inventors: **Mathieu Morati**, Belfort (FR); **Franck Terrien**, Evette Salbert (FR)

(73) Assignee: **GE Energy Power Conversion Technology Ltd.** (GB)

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H02J 3/16 (2006.01)
H02J 3/00 (2006.01)

(52) **U.S. Cl.**
CPC ... ***H02J 1/00*** (2013.01); ***H02J 3/16*** (2013.01); *H02J 2003/002* (2013.01); *Y02E 40/34* (2013.01); *Y10T 307/707* (2015.04)

(58) **Field of Classification Search**
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USPC 307/82
See application file for complete search history.

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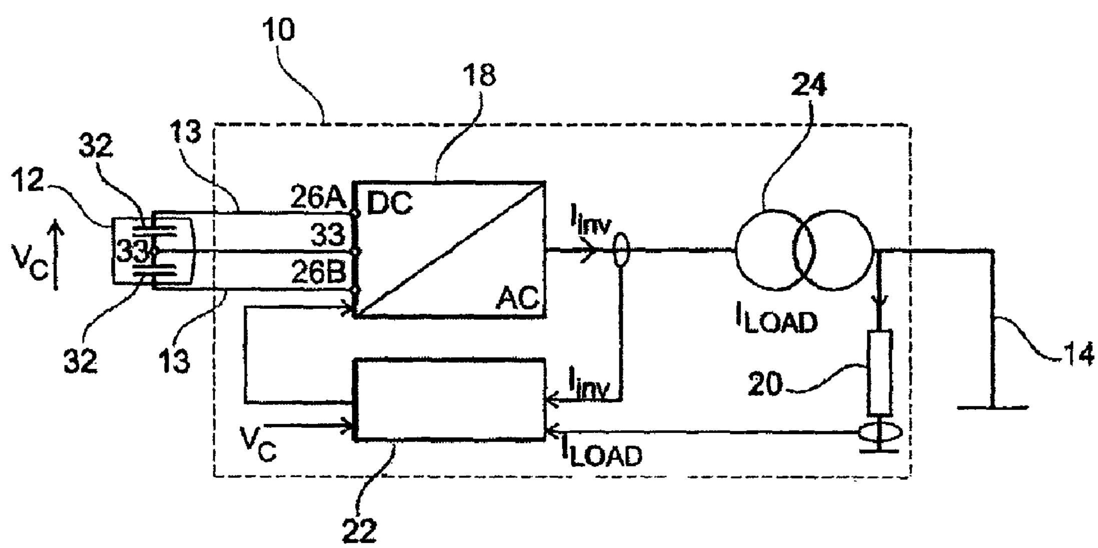
Primary Examiner — Thienvu Tran
Assistant Examiner — Kevin J Comber
(74) *Attorney, Agent, or Firm* — Parks Wood LLC

(57) **ABSTRACT**

A reactive energy compensator (**10**) comprising:
- an input DC voltage (V_c) bus (**13**) capable of providing reactive energy;
- an inverter (**18**) connected to the DC voltage bus (**13**) and including controllable electronic switches (**34**) capable of converting the input DC voltage (V_c) into an intermediate alternating voltage,
- a device (**22**) for controlling the electronic switches,
- regulation means (**22**) for determining a value of a target active current circulating between the inverter and the network, capable of regulating the input direct current voltage (V_c) relatively to a set reference value;

the device for controlling the switches, determining control signals according to the value of said target active current, determined from the error between the reference value and the square of the DC voltage of the bus via a transfer function, the definition of which varies according to the current value of said DC voltage.

8 Claims, 3 Drawing Sheets



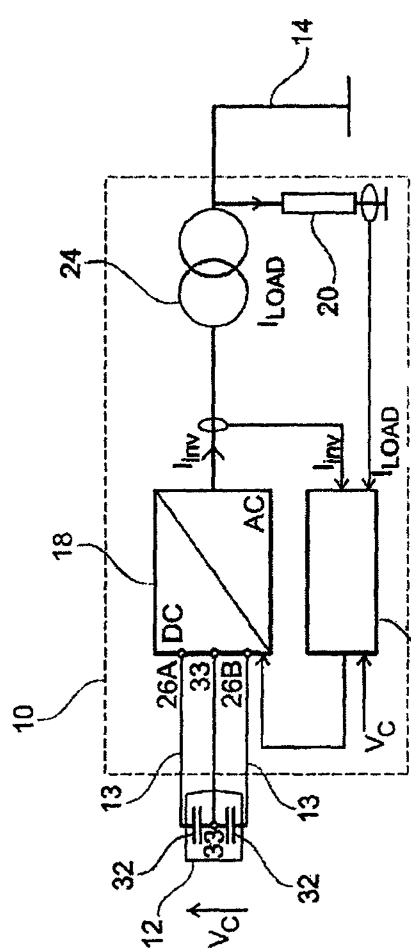

10
18
24
14
DC
AC
26A
33
26B
13
13
32
33
32
12
V_C
V_C
I_{inv}
I_{inv}
I_{LOAD}
I_{LOAD}
20
22

FIG.1

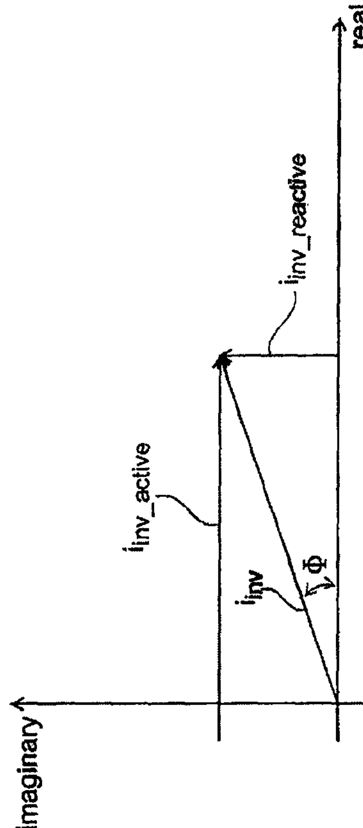

real
imaginary
$i_{inv\_reactive}$
i_{inv_active}
i_{inv}
Φ

FIG.2

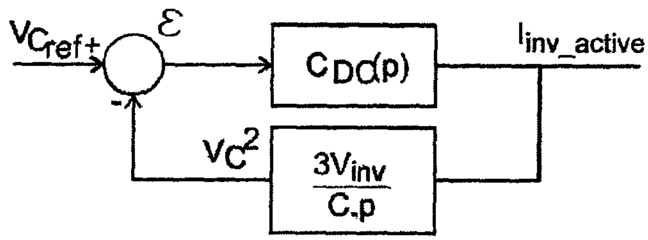


FIG.3

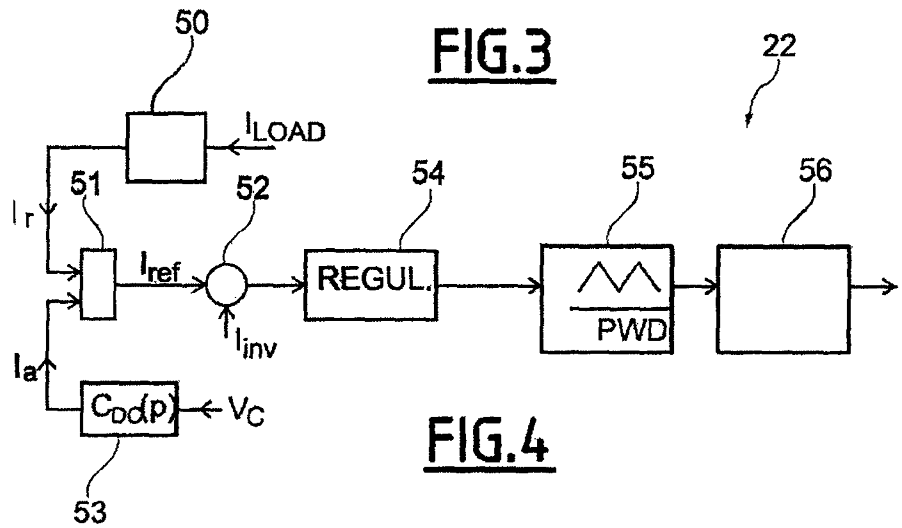


FIG.4

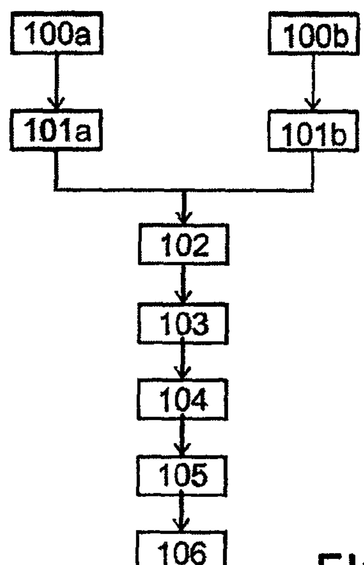


FIG.6

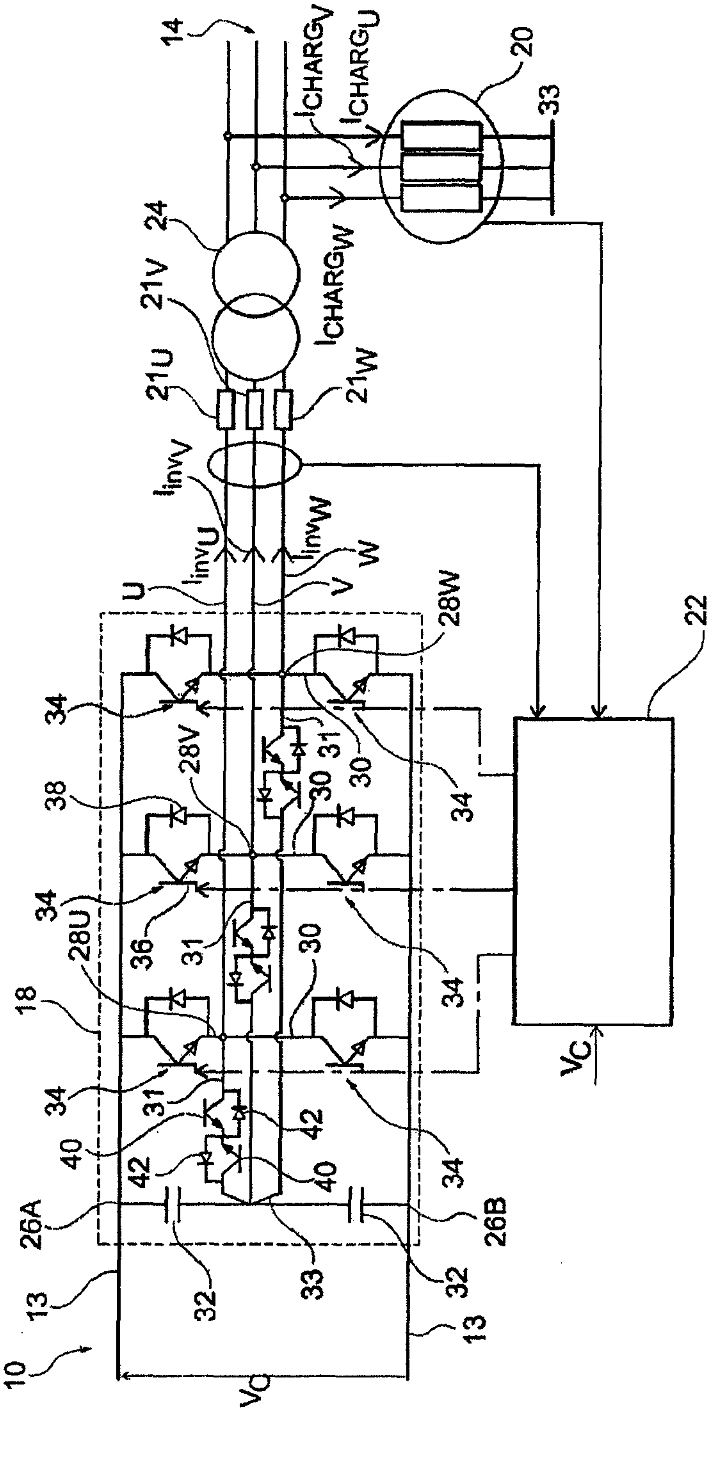

14
I_{CHARG_V}
I_{CHARG_U}
20
33
24
21V
I_{CHARG_W}
21U
21W
I_{inv_V}
I_{inv_U}
I_{inv_W}
U
V
W
28W
22
34
38
28V
31
30
36
28U
18
40
42
26A
26B
32
33
13
10
V_C

FIG.5

REACTIVE ENERGY COMPENSATOR AND METHOD FOR REDUCING THE ASSOCIATED FLICKERING PHENOMENON

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 USC §119 to French patent application FR 11 61234, filed Dec. 6, 2011, which is incorporated herein by reference in its entirety.

The present invention relates to a reactive energy compensator capable of being electrically connected to an alternating electric network including M phase(s), M being greater than or equal to 1, of the type comprising:

- M terminals for connecting to the alternating electric network, said or each connecting terminal corresponding to one phase of the network,
- at least one input DC voltage bus capable of providing reactive energy,
- at least one inverter connected to the DC voltage bus and including controllable electronic switches capable of converting the input DC voltage into an intermediate alternating voltage including M phase(s) and corresponding to one phase of the intermediate current, the intermediate terminals corresponding to a same phase being connected to the corresponding connection terminal,
- a device for calculating signals for controlling the electronic switches of the inverters.

A reactive energy compensator of the aforementioned type is known from the document <<Modern active filters and traditional passive filters>> of H. Akagi, published in 2006 in <<Bulletin of the Polish Academy of Sciences—Technical sciences—Vol. 4—No. 3>>. Six inverters are connected in parallel to each other and connected on one side to a bank of capacitors, and on the other side to a three-phase network. The six inverters are connected together, on the side of the three-phase network, via a transformer including six secondary circuits. The signals for controlling the electronic switches of these inverters are pulse-width modulated signals.

Such a reactive energy compensator placed in an electric network gives the possibility of compensating for the circulation of reactive power from a load connected onto the electric network which affects the quality of the electric power delivered on the network.

Nevertheless, in such an electric network, flickering problems, further called scintillation problems, may arise on devices connected to the network, for example on computer screens or light sources. They correspond to fluctuation phenomena of the electric voltage delivered by the network, caused by electromagnetic perturbations or changes in power on the network for example caused by disconnections of devices with high electric consumption, such as arc furnaces, motors, etc. The object of the invention is to reduce these flickering problems.

For this purpose, according to a first aspect, the object of the invention is a reactive energy compensator of the aforementioned type, characterized in that it further includes regulation means, adapted for determining the value of a target active current circulating between the inverter and the network capable of regulating the input direct current voltage relatively to a set reference value;

the device for calculating signals for controlling the switches, determining control signals depending on the value of said determined target active current;

the target active current value being determined from the error between the reference value and the square of the DC voltage of the bus via a transfer function, the definition of which varies according to the current value of said DC voltage.

Such a reactive energy compensator gives the possibility of compensating for the reactive energy of loads on the network, while reducing the occurrence of flickering phenomena on the network.

In embodiments, the reactive energy compensator according to the invention further includes one or more of the following features:

- the DC voltage bus comprises a bank of capacitor(s), the bank of capacitor(s) including at least one capacitor;
- the Laplace transform of the transfer function $C_{DC}(p)$ is written as:

$$C_{DC}(p) = K_{dc} \quad \text{or}$$

$$C_{DC}(p) = K_{dc} + \frac{K_{idc}}{p}$$

with

$$K_{dc} = A * [1 + B * f(Vc, Vref)]$$

and

$$K_{idc} = C * [1 + D * f(Vc, Vref)], A, B, C \text{ and } D$$

being constants and f(Vc,Vref) being a function for which the input variables are the current values of the input voltage Vc and of the reference value Vref;

- the regulation means are further adapted for determining a value of a target reactive current circulating between the inverter and the network with view to compensating for reactive energy from a load on the network, the device for calculating signals for controlling the switches, determining control signals depending on the value of said determined target reactive current.

According to a second aspect, the present invention proposes a method for reducing the flickering phenomenon in an alternating electric network, said method being intended to be applied in a reactive energy compensator capable of being electrically connected to the alternating electric network including M phase(s), M being greater than or equal to 1, said compensator comprising:

- M terminals for connection to the alternating electric network, said or each connecting terminal corresponding to a phase of the network,
- at least one input DC voltage bus capable of providing reactive energy,
- at least one inverter connected to the DC voltage bus and including controllable electronic switches capable of converting the input DC voltage into an intermediate alternating voltage including M phase(s) and corresponding to a phase of the intermediate current, the intermediate terminals corresponding to a same phase, being connected to the corresponding connecting terminal,
- a device for calculating signals for controlling the electronic switches of the inverters, said method being characterized in that it includes the following steps:

determining, by regulation means, a value of a target active current circulating between the inverter and the network capable of regulating the input direct current voltage relatively to a set reference value, said value of a target active current, being determined from the error between the reference value and the square of the DC voltage of the bus via a transfer function, the definition of which varies according to the current DC voltage value;

determining, by the device for calculating signals for controlling the switches, control signals according to the determined value of said target active current.

These features and advantages of the invention will become apparent upon reading the description which follows, only given as an example and made with reference to the appended drawings, wherein:

FIG. **1** illustrates a conversion system in an embodiment of the invention;

FIG. **2** illustrates the active and reactive components of an electric signal of the current or voltage type;

FIG. **3** illustrates a linear system in a closed loop;

FIG. **4** illustrates control means in an embodiment of the invention;

FIG. **5** illustrates a conversion system in an embodiment of the invention;

FIG. **6** is a flow chart of a method in an embodiment of the invention.

FIG. **1** illustrates a system **10** for converting an input direct current into an output polyphase alternating current which also achieves conversion of an input DC voltage into an output polyphase alternating voltage. The conversion system **10** is connected to a DC current source **12** and to a DC voltage (Vc) bus **13** on the one hand. It is connected to an electric network **14** on the other hand.

The DC voltage bus **13** provides a voltage Vc, with a value for example equal to 15 kV.

The electric network **14** is for example a three-phase alternating network with a high voltage, typically of the order of 33,000 V.

A load, **20**, for example an arc furnace, is also connected to the electric network **14**.

The current conversion system **10** comprises a voltage inverter **18** capable of converting an input direct current into an output polyphase alternating current. This inverter is connected to the current source **12** via the DC voltage bus **13**.

In the relevant embodiment, the current source **12** includes a bank of two capacitors **32** separated by a neutral point **33**.

The current I_{inv} appearing in FIG. **1** identifies an alternating current provided as the output of the inverter for any phase.

The conversion system **10** also includes means **22** for controlling the inverter **18**, adapted so as to control the inverter so as to drive the output current delivered by the inverter **18** for each phase.

The conversion system **10** also includes impedances on each phase which are illustrated in FIG. **3**, connected at the output of the inverter **18** and a voltage transformer **24**. The output of the transformer **24** is connected to the electric network **14**.

FIG. **2** provides a vectorial representation of a current I_{inv} provided by the conversion system **10** relatively to a voltage V_{inv} delivered on the network **14** by the conversion system **10**. The current I_{inv} is phase-shifted by an angle ϕ relatively to the voltage V_{inv}. In FIG. **2**, the active component (or real component) I_{inv_actif} of the current I_{inv} is distinguished parallel to the abscissa, in phase with the voltage V_{inv}, and the reactive component (or imaginary component) $I_{inv\_réactif}$ of the current I_{inv} parallel to the ordinates.

In the relevant embodiment, the conversion system **10** is a reactive energy compensator capable of compensating for variations of reactive energy on the alternating network **14**, via the direct current source **12** and the direct voltage bus **13**, capable of providing reactive energy, by adjusting the phases

of the electric current relatively to those of the electric voltage, delivered on the network.

The voltage inverter **18** includes an input positive terminal **26**A, an input negative terminal **26**B, a neutral terminal **33** and M output terminals. Each output terminal corresponds to a respective phase of the output polyphase alternating current capable of being delivered by the inverter. The output current includes a plurality M of phases, M being an integer greater than or equal to one.

In the exemplary embodiment of FIG. **5**, the number M of phases is equal to three and the voltage inverter **18** is a three-level three-phase inverter clamped by the neutral.

The three-phase inverter **18** comprises an input positive terminal **26**A, an output negative terminal **26**B and three output terminals **28**U, **28**V, **28**W each corresponding to a respective phase U, V, W.

The inverter **18** further comprises, for each output terminal **28**U, **28**V, **28**W, a switching branch **30** connected between both input terminals **26**A, **26**B and a clamping branch **31** connecting the neutral to a middle point of the associated switching branch. At the output of the inverter **18**, the current I_{invU}, I_{invV}, I_{invW} circulates on the phase U, V, W respectively.

The DC voltage source **12** comprises two capacitors **32** connected in series between both input terminals **26**A, **26**B and connected together in a middle point **33** forming the neutral.

Alternatively, each capacitor **32** is replaced with a DC voltage source.

Each switching branch **30** comprises two controllable electric switches **34** connected in series and in the same direction, and connected together through a middle point, each middle point forming an output terminal **28**U, **28**V, **28**W.

As known per se, each electric switch **34** is a bidirectional current switch and a unidirectional voltage switch. Each electric switch **34** comprises a transistor **36** and a diode **38** in an antiparallel configuration thereby providing bidirectional current circulation paths when the transistor **36** is conducting.

All the electric switches **34** are for example identical. Transistor **36** is for example an insulated gate bipolar transistor, also called an IGBT (Insulated Gate Bipolar Transistor).transistor. The gate of each transistor **36** is connected to the control means **22** in order to receive a corresponding control signal.

Each clamping branch **31** is connected between the middle point **33** and an output terminal **28**U, **28**V, **28**W. Each clamping branch **31** includes two transistors **40** connected head-to-tail and in series. It also includes two diodes **42**, each being connected in an antiparallel configuration on a respective transistor **40**, thereby providing bidirectional current circulation paths when the corresponding transistor **40** is conducting.

The transistors **40** are for example IGBT transistors.

Between the conversion system **10** and the transformer **24**, an inductance 21_u, 21_v, 21_w, is positioned on phase U, V, W respectively.

The load **20** consumes a respective current I_{LOADU}, I_{LOADV}, I_{LOADW} on the route U, V, W respectively.

In the relevant embodiment, the control means **22** are adapted for driving and controlling the compensation for the circulation of reactive power on the network **14** and for thereby increasing the power factor of the network on the one hand, and for driving and controlling the reduction of the flickering phenomena occurring on the network **14** on the other hand.

Let C be the value of the capacitance of the DC voltage source **12** expressed in farads, the active power P_{inv} (t), depending on time t, which is exchanged between the inverter **18** and the network **14** on any relevant phase U, V or W, may be expressed in this way:

$$P_{inv}(t) = C\frac{dV_c}{dt} \times V_c = \frac{1}{2} \times C \times \frac{dV_c^2}{dt}; \quad (1)$$

wherein V_c is the voltage on the terminals of the DC voltage source **12**.

By using the Concordia transform, and then the Park transform, this equation (1) is written in the following way:

$$\frac{3}{2} \times V_{inv} \times I_{inv\_active} = \frac{1}{2} \times C \times \frac{dV_c^2}{dt}; \quad (2)$$

wherein V_{ond} is the output voltage of the inverter in the Park reference system and I_{inv_active} is the active current component in the Park reference system at the output of the inverter **18**.

By using Laplace's transform equation (2) gives:

$$3 \times V_{inv} \times I_{inv\_active} = C \times V_c^2(p) \times p \quad (3);$$

wherein p is the Laplace operator.

In the relevant conversion system **10**, by driving the value of the current I_{inv_active} it is possible to regulate the voltage V_c of the voltage source **12**. Formula (3) describes the relationship between the active current of the inverter I_{inv_active} and the square of the voltage of the voltage source. By controlling I_{inv_actif}, V_c^2 and therefore the voltage V_c are controlled.

In order to apply this driving, a target active current value at the output of the inverter **18** is determined according to equation (4):

$$I_{inv\_active}(p) = C_{DC}(p) \times (V_{ref} - V_c^2(p)), \quad (4)$$

wherein $C_{DC}(p)$ is the transfer function of the regulator C_{DC}, expressed by means of the Laplace transform, relating the Laplace transform of the current I_{inv_active} (p) and the Laplace transform of the error between the square of the voltage on the terminals of the DC voltage source and a reference voltage of set value V_{ref} such that the voltage V_c of the DC current source **12** is desirably stabilized to the value V_{ref}.

The linear system with a closed loop corresponding to equations 3 and 4 is illustrated in FIG. **3**.

The corresponding transfer function in an open loop FTBO (p) and the corresponding transfer function in a closed loop FTBF(p) are therefore written as:

$$FTBO = C_{DC}(p) \times 3 \times \frac{V_{inv}}{C \times p} = C_{DC}(p) \times \frac{K}{p} \quad (5)$$

$$\text{with } K = \frac{3 \cdot V_{inv}}{C} \approx \text{constant}$$

$$FTBF = \frac{1}{1 + \frac{p}{K \times C_{DC}(p)}} \quad (6)$$

In these formulae, V_{inv} is a value which may be considered as an average value constant. This statement is true since this equation is developed from formula (2) which is expressed in the Park reference system.

The determined target current value I_{inv_active} by means of this control loop illustrated in FIG. **3** corresponds to the active current reference which the conversion system **10** has to provide in order to regulate the voltage of the DC voltage bus **13** to the reference value V_{ref}.

According to the invention, the regulator $C_{DC}(p)$ is adjustable depending on the measured current value of the voltage V_c. This arrangement has the function of ensuring regulation of the voltage V_c in a set interval of values around the value V_{ref}, while letting the voltage V_c of the DC voltage bus **13** freely fluctuate in this interval. This fluctuation has the effect of reducing the number of flickering events in the network **14**.

Thus, as the value of the voltage V_c is actually within the fluctuation interval, the regulator $C_{DC}(p)$ is very slow, of the order of one second. Conversely, the more the value of the voltage approaches the limits of the fluctuation interval, the faster is the regulator $C_{DC}(p)$ so that the value of the voltage V_c does not exit the fluctuation interval.

In an embodiment, the formula of $C_{DC}(p)$ is the following:

$$C_{DC}(p) = \frac{1}{T \times K} = K_{DC} \quad (7)$$

wherein K is the term described in (5) which is constant. It is K_{DC} which has to vary according to Vc. In order to increase the rapidity of the regulator, the value of $C_{DC}(p)$ has to be changed and therefore that of K_{DC} as a function of Vc. The variation law of K_{DC} in formula (7) is for example: $Kdc = A^*[1+B^*f(V_c, V_{ref})]$,

wherein $f(V_c, V_{ref})$ is a mathematical function (absolute value function, square function, linear or non-linear functions, etc., . . .), the variables of which are V_c and V_{ref}. A and B are gains (not variable according to V_c and V_{ref}) depending on several parameters of the system which are desirably controlled, such as for example the value of the storage capacity of the DC bus, the control rapidity of the compensator etc. . . .

Such a corrector $C_{DC}(p)$ is of the proportional type.

In another embodiment, the formula of $C_{DC}(p)$ is the following:

$$C_{DC}(p) = K_{dc} + \frac{K_{idc}}{p} \quad (8)$$

wherein K_{idc} and K_{dc} may vary according to several laws, for example:

$$Kdc = A^*[1+B^*f(V_c, V_{ref})]$$

$$Kidc = C^*[1+D^*f(V_c, V_{ref})]$$

wherein $f(V_c, V_{ref})$ is a mathematical function (absolute value, square function, linear or non linear functions, etc. . . .), the variables of which are V_c and V_{ref}. A,B,C,D are gains depending several parameters of the system which are desirably controlled, such as for example the value of the storage capacity of the DC bus, the control rapidity of the compensator, etc. . . .

Such a corrector $C_{DC}(p)$ is of the Proportional Integral type.

The processing modules of the control means **22** adapted on the one hand for allowing compensation of the reactive energy on the network **14** and on the other hand for reducing flickering problems, are described with reference to FIG. **4**.

The current in the load **20** and the current delivered by the inverter which are relative to a same phase will respectively be designated as I_{LOAD} and I_{inv}.

A reactive power compensation block **50** receives at the input measurements of the current I_{LOAD} consumed by the load **20** and is adapted so as to apply an algorithm for determining a target value of the current Ir at the output of the inverter **18** allowing compensation of the reactive power of the load **20** on the relevant phase.

This algorithm comprises the following steps:

Step 1: Identifying from the current I_{LOAD}, the reactive and active value of this current. With Park's transform, this identification is made possible by separating the currents on two quadrature axes, which correspond to the reactive and active portions of the measured current.

Step 2: The totality of the identified reactive current is sent as a reactive component reference to the summing circuit **51**.

Step 3: Depending on the energy storage capacity of the DC bus, the totality or a portion of the active current identified from the current I_{LOAD} is sent as an active component reference to the summing circuit **51**.

Ir therefore corresponds to the sum of both of these currents as determined in these steps 2 and 3.

A control block **53** receives as an input the current value of the voltage on the terminals of the DC voltage source **12**.

The control block **53** is adapted so as to determine, depending on this value, the formula of the regulator to be applied C_{DC}(p). The control block **53** is adapted so as to calculate the target value of the active current **1***a* at the output of the inverter **18**, according to formula 4, allowing regulation of the value of the voltage V_c by reducing the flickering phenomena.

A summing circuit **51** is adapted so as to sum the target currents Ir and la determined by the reactive power compensation block **50** and the regulation block **53** and for thus determining a value I_{ref} of the target current resulting from this sum.

This current I_{ref} is the current to be provided by the inverter on the relevant phase which allows compensation of the reactive load on the one hand and reduction of the flickering problem on the other hand.

A subtracting circuit **52** allows calculation of the difference between this resulting target current I_{ref} and the current value of the current I_{inv} measured at the output of the inverter.

The value of this calculated difference is provided at the input of a current regulator **54**. This regulator **54** is capable of calculating, according to the calculated difference, modulating voltage signals for the relevant phase.

This regulator is of the PI (Proportional Integral) type conventionally used in the regulation of looped systems (cf. for example http://en.wikipedia.org/wiki/PID_controller).

These modulating voltage signals are provided at the input of a modulator **55** suitable for proceeding with pulse width modulation with interlacing of the pulses and a phase shift corresponding to the relevant phase (cf http://en.wikipedia.org/wiki/Pulse-width_modulation for a general description of such a modulator). In one step, the modulator is adapted in order to compare a modulating voltage received at the input to a triangular signal.

The results of this comparison are provided at the input of a control module **56** capable of determining, according to said results of the control signals intended for the switches **34** of the relevant phase and of applying them to these switches **34**.

In FIG. **6**, are illustrated the steps of a method in an embodiment of the invention, applied by the conversion system **10**.

In a step **100***a*, I_{LOAD} circulating in the load **20** of the network **14**, relatively to a given phase, is measured.

In a step **101***a*, a reactive target current Ir to be provided by the inverter **18** is determined according to the measured current circulating in the load **20**.

In parallel with these steps **100***a*, **101***a*, in a step **100***b*, a current I_{inv} circulating at the output of the inverter **18** on the relevant phase, is measured.

In a step **101***b*, an active target current **1***a* to be provided by the inverter **18** is determined according to the current circulating in the load **20**, measured, as described above by means of the regulator C_{DC}(p), according to formula 4, allowing regulation of the voltage V_c by reducing the flickering phenomena.

In a step **102**, the target currents Ir and Ia are summed, the result of this sum determining a value I_{ref} of the target current resulting from this sum.

This current I_{ref} is the target current, to be provided by the inverter **18** on the relevant phase, which allows compensation for the reactive load on the one hand and reduction of the flickering problem on the other hand.

In a step **103**, the difference between this resulting target current I_{ref} and the current value of the current I_{inv} measured at the output of the inverter is calculated.

In a step **104**, modulating voltage signals of the relevant phase are determined, depending on the calculated difference, as described above.

In a step **105**, pulse width modulation with interlacing of the pulses with a phase shift corresponding to the relevant phase is achieved according to these modulating voltage signals, comprising an operation for a comparison between a modulating voltage and a triangular signal.

In a step **106**, control signals intended for the switches **34** of the relevant phase are determined according to the modulation signals and applied to the switches **34** of the relevant phase.

The steps relating to the compensation of the reactive load on the one hand and to the reduction of the flickering may, according to the embodiments, either be applied sequentially or in parallel. In the case when this would be achieved sequentially, the reactive component of the measured current I_{inv} is subtracted from the target reactive current Ir, with view to determining according to this difference, the control signals to be applied to the switches **34** in order to compensate for the reactive energy of the load.

Also, the component of the measured current I_{inv} is subtracted from the target active current Ia, with view to determining, depending on this difference, the control signals to be applied to the switches **34** for reducing flickering on the network.

The invention therefore allows both reduction in the occurrence of flickering phenomena on the network **14**, while compensating for the reactive power of loads on the network.

What is claimed is:

1. A reactive energy compensator capable of being electrically connected to an alternating electric network including M phase(s), M being greater than or equal to 1, of the type comprising:

M terminals for connecting to the alternating electric network, said or each connecting terminal corresponding to a phase of the network,

at least one input DC voltage bus capable of providing reactive energy,

at least one inverter connected to the DC voltage bus and including controllable electronic switches capable of converting the input DC voltage into an intermediate alternating voltage including M phase(s) and corresponding to a phase of the intermediate current, the intermediate terminals corresponding to a same phase being connected to the corresponding connecting terminal,

a device for calculating signals for controlling the electronic switches of the inverters, further including regulation means, adapted for determining a value of a target active current circulating between the inverter and the network capable of regulating the input DC voltage with respect to a set reference voltage;

the device for calculating signals for controlling the switches determining control signals depending on the determined value of said target active current;

the target active current value being determined from the error between the reference value and the square of the DC voltage of the bus via a transfer function, the definition of which varies according to the current value of said DC voltage.

2. The reactive energy compensator according to claim **1**, wherein the DC voltage bus comprises a bank of capacitor(s), the bank of capacitor(s) including at least one capacitor.

3. The reactive energy compensator according to claim **1**, wherein the Laplace transform of the transfer function C_{DC} (p) is written as:

$$C_{DC}(p) = K_{dc} \text{ or}$$

$$C_{DC}(p) = K_{dc} + \frac{K_{idc}}{p}$$

with

$$K_{dc} = A * [1 + B * f(Vc, Vref)]$$

and

$$K_{idc} = C * [1 + D * f(Vc, Vref)], A, B, C \text{ and } D$$

being constants and f(Vc,Vref) being a function, the input variables of which are the current values of the input voltage Vc and of the reference voltage Vref.

4. The reactive energy compensator according to claim **1**, wherein the regulation means are further adapted in order to determine a value of a target reactive current circulating between the inverter and the network with view to compensating for a reactive energy from a load on the network, the device for calculating signals for controlling the switches, being adapted for determining control signals according to the determined value of said target reactive current.

5. A method for reducing flickering in an alternating electric network, said method being intended to be applied in a reactive energy compensator capable of being connected electrically to the alternating electric network including M phase(s), M being greater than or equal to 1, said compensator comprising:

M terminals for connecting to the alternating electric network, said or each connecting terminal corresponding to a phase of the network,

at least one input DC voltage bus capable of providing reactive energy,

at least one inverter connected to the DC voltage bus and including controllable electronic switches capable of converting the input DC voltage into an intermediate alternating voltage including M phase(s) and corresponding to a phase of the intermediate current, the intermediate terminals corresponding to a same phase being connected to the corresponding connecting terminal,

a device for calculating signals for controlling the electronic switches of the inverters, said method including the following steps:

determining, by a regulation means, a value of a target active current circulating between the inverter and the network, capable of regulating the input DC voltage relatively to a set reference value, said target active current value being determined from the error between the reference value and the square of the DC voltage of the bus via a transfer function, the definition of which varies according to the current DC voltage value;

determining, by the device for calculating signals for controlling the switches, control signals according to the determined value of said target active current.

6. The method for reducing flickering according to claim **5**, according to which the DC voltage is provided by a bank of capacitor(s) including at least one capacitor.

7. The method for reducing flickering according to claim **5**, according to which the Laplace transform of the transfer function C_{DC}(p) is written as:

$$C_{DC}(p) = K_{dc} \text{ or}$$

$$C_{DC}(p) = K_{dc} + \frac{K_{idc}}{p}$$

with

$$K_{dc} = A * [1 + B * f(Vc, Vref)]$$

and

$$K_{idc} = C * [1 + D * f(Vc, Vref)], A, B, C \text{ and } D$$

being constants and f(Vc,Vref) being a function, the input variables of which are the current values of the input voltage Vc and of the reference voltage Vref.

8. The method for reducing flickering according to claim **5**, further comprising a step for determining, by the regulation means, a value of a target reactive current circulating between the inverter and the network with view to compensating for reactive energy from a load on the network, and a step for determining by the device for calculating signals for controlling the switches, control signals according to the determined value of said target reactive current.

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